

### Means to Solve the Problems

- [0009] The invention in claim 1 is a semiconductor light-emitting element mounting member including: a substrate; and a metal film formed on a surface of the substrate, formed from Ag, Al, or an alloy containing the metals, and functioning as an electrode layer for mounting a semiconductor light-emitting element and/or a reflective layer for reflecting light from a semiconductor light-emitting element; wherein: the thickness of the metal film is  $0.5 - 3 \mu\text{m}$  and crystal grains of the metal or alloy forming the metal film have a particle diameter along a surface plane of the metal film is no more than  $0.5 \mu\text{m}$ ; and the surface of the metal film has a center-line average radius Ra of no more than  $0.1 \mu\text{m}$ .
- [0010] The invention in claim 2 is a semiconductor light-emitting element mounting member according to claim 1 wherein an adhesion layer and a barrier layer are formed, in sequence, on the substrate, with the metal film being formed thereon.

The invention in claim 3 is a semiconductor light-emitting element mounting member according to claim 1 wherein the metal film is formed as an alloy of Ag and/or Al and another metal, a proportional content of the other metal being  $0.001 - 10$  percent by weight.

- [0011] The invention in claim 4 is a semiconductor light-emitting element mounting member according to claim 3 wherein the other metal is at least one type of metal selected from a group consisting of Cu, Mg, Si, Mn, Ti, and Cr.

The invention in claim 6 is a semiconductor light-emitting element mounting member according to claim 1 wherein the metal film is formed from Al alone or from an alloy of Al and another metal.

[0012] The invention in claim 7 is a semiconductor light-emitting element mounting member according to claim 1 wherein a thermal expansion coefficient of the substrate is  $1 \times 10^{-6}/\text{K} - 10 \times 10^{-6}/\text{K}$ .

The invention in claim 8 is a semiconductor light-emitting element mounting member according to claim 1 wherein a thermal conductivity of the substrate is at least 80 W/mK.

10 The invention in claim 9 is a semiconductor light-emitting element mounting member according to claim 1 wherein the semiconductor light-emitting element mounting member is a flat submount.

[0018] The invention in claim 10 is a semiconductor light-emitting device wherein a semiconductor light-emitting element is mounted in a semiconductor light-emitting element mounting member according to claim 1.

15 The invention in claim 11 is a semiconductor light-emitting device according to claim 10 wherein output is at least 1 W.

#### Advantages Effect of the Invention

[0014] With the structure in Claim 1, the smoothness of the surface of the metal film can be improved.

More specifically, based on the shapes of the portions of the individual

preventing dispersion of Ag and Al to the adhesion layer by preventing the reduction adhesion strength through the limiting of reactions between the Ag or Al forming the metal layer and the Ti or the like forming the adhesion layer resulting from thermal hysteresis (roughly no more than 300 deg C) during  
5 post-processing, e.g., the mounting of the element. The metal film is formed on top of the barrier layer. As a result, adhesion of the metal film to the substrate can be improved.

[0018] Furthermore, according to the invention in claim 3, the metal film is formed from an alloy of Ag and/or Al and a predetermined proportion of  
10 another metal. This can improve mechanical strength. Use of an alloy can also prevent migration of Ag and Al. As a result, mechanical strength and reliability of the metal film can be improved.

As described in Claim 4, the other metal in the alloy described above can be at least one type of metal selected from a group consisting of Cu, Mg, Si,  
15 Mn, Ti, and Cr.

Taking into account the need to use high current while maintaining the smoothness of the surface, the film thickness of the metal film is 0.5 - 3 µm.

[0019] Also, if the structure is to be combined with a semiconductor light-emitting element that emits light with a short wavelength of no more  
20 than 400 nm, it would be preferable for the main metal forming the metal layer to be Al, which provides superior reflectivity for light with this type of short wavelength. Thus, as described in Claim 6, it would be preferable for the

## CLAIMS

1. (Amended) A semiconductor light-emitting element mounting member comprising: a substrate; and a metal film formed on a surface of said substrate,  
5 formed from Ag, Al, or an alloy containing said metals, and functioning as an electrode layer for mounting a semiconductor light-emitting element and/or a reflective layer for reflecting light from a semiconductor light-emitting element; wherein: the thickness of the metal film is 0.5 - 3  $\mu$  m and crystal grains of said metal or alloy forming said metal film have a particle diameter  
10 along a surface plane of said metal film is no more than 0.5  $\mu$ m; and said surface of said metal film has a center-line average roughness Ra of no more than 0.1  $\mu$ m.
2. A semiconductor light-emitting element mounting member according to claim 1 wherein an adhesion layer and a barrier layer are formed, in sequence,  
15 on said substrate, with said metal film being formed on said barrier layer.
3. A semiconductor light-emitting element mounting member according to claim 1 wherein said metal film is formed as an alloy of Ag and/or Al and other metal, a proportional content of said other metal being 0.001 - 10 percent by weight.
- 20 4. A semiconductor light-emitting element mounting member according to claim 3 wherein said other metal is at least one type of metal selected from a group consisting of Cu, Mg, Si, Mn, Ti, and Cr.
5. (Deleted)